Supporting Information

Cost-Effective Preparation of Layered Tantalum Oxynitrides for Visible-light-driven Photocatalysis

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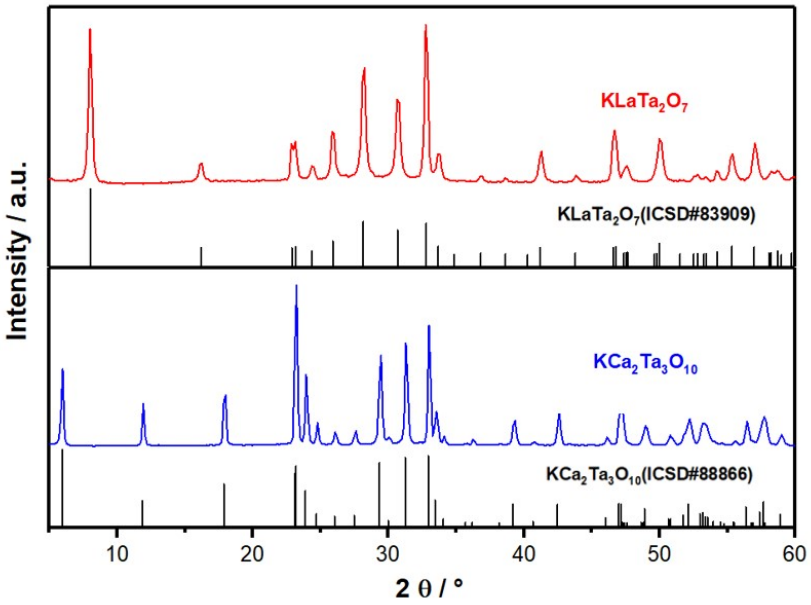

Figure S1. XRD patterns of the oxide precursors $KLaTa_2O_7$, and $KCa_2Ta_3O_{10}$.

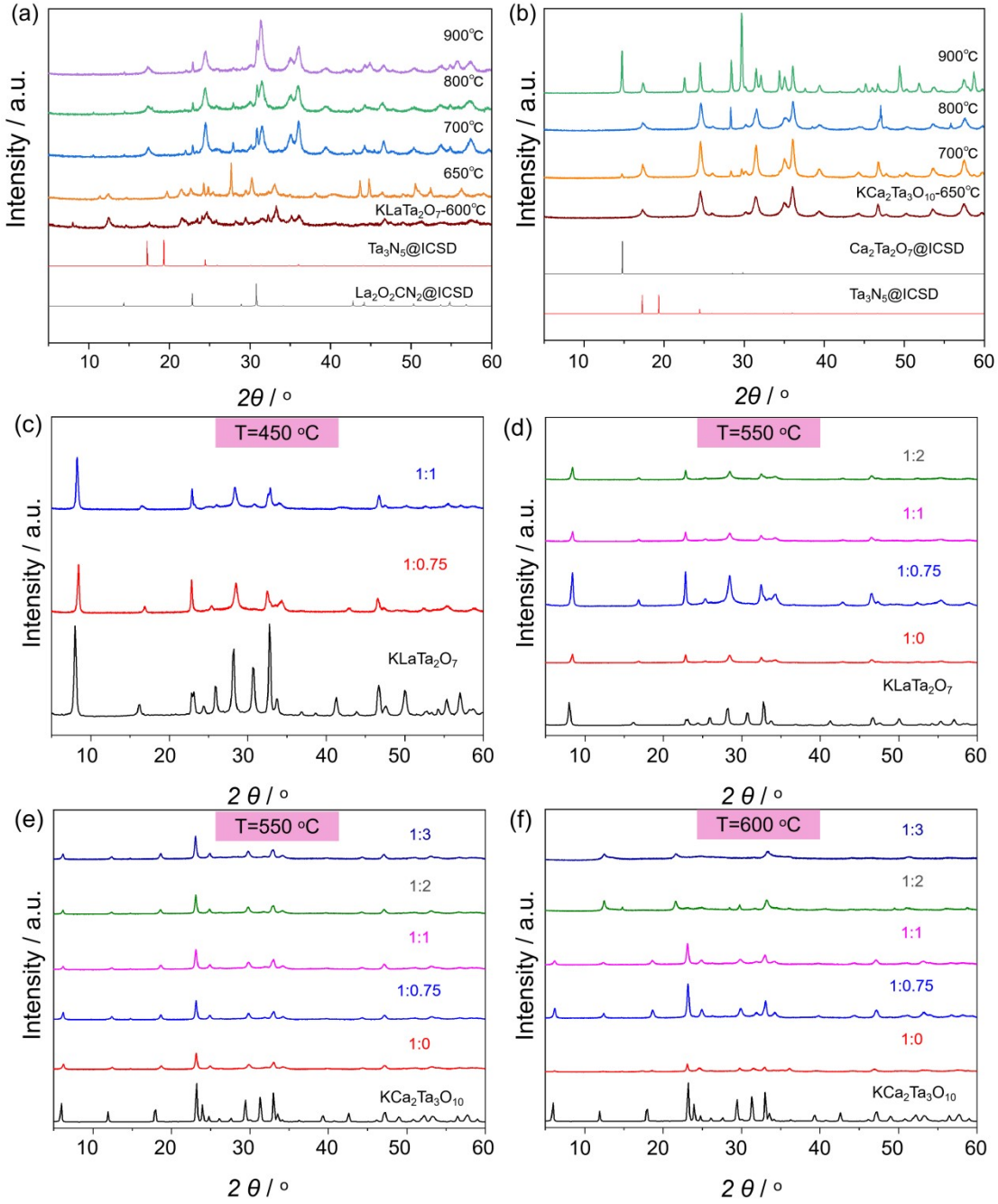

Figure S2. XRD patterns of the nitrided products of (a) $KLaTa_2O_7$, (b) $KCa_2Ta_3O_{10}$ obtained at 600-900 ℃ for 3 h with a molar ratio of oxide/K_2CO_3 is 1:1. XRD patterns of the nitrided products of (c) (d) $KLaTa_2O_7$ and (e) (f) $KCa_2Ta_3O_{10}$ with different addition of K_2CO_3 obtained at the selected temperatures.

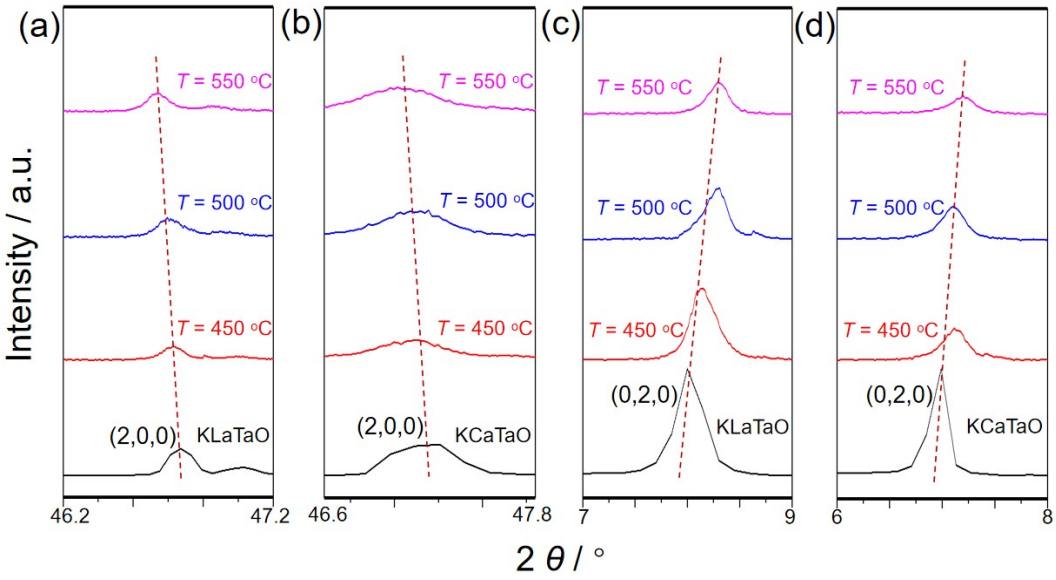

Figure S3. XRD patterns of (2,0,0) plane of (a) $KLaTa_2O_7$ (b) $KCa_2Ta_3O_{10}$, and (0,2,0) plane of (c) $KLaTa_2O_7$ (d) $KCa_2Ta_3O_{10}$, along with those after heating at 450, 500 and 550 ℃ for 3 h.

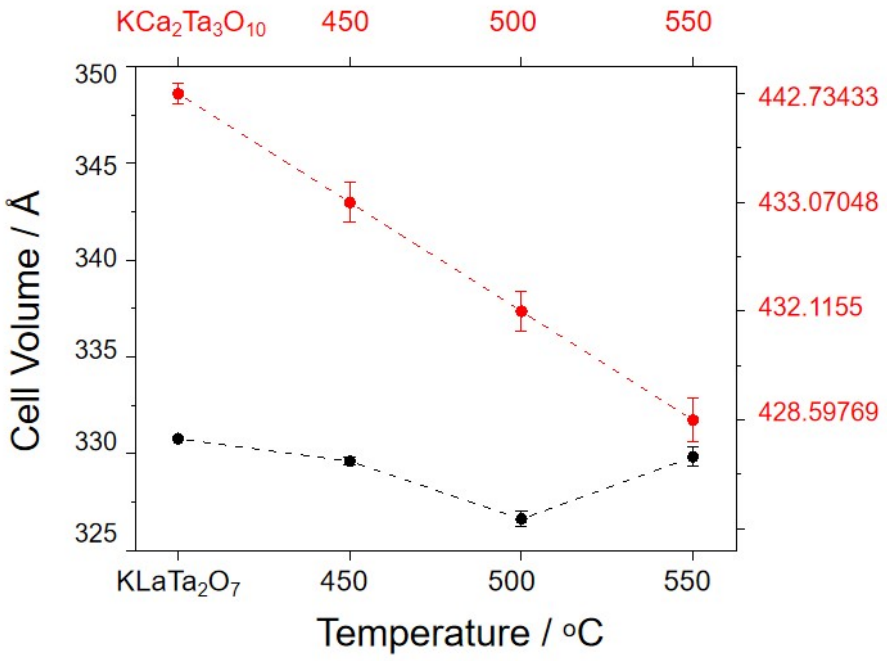

Figure S4. Evolution of the crystal cell volume as a function of reaction temperatures for nitrided products of $KLaTa_2O_7$ and $KCa_2Ta_3O_{10}$.

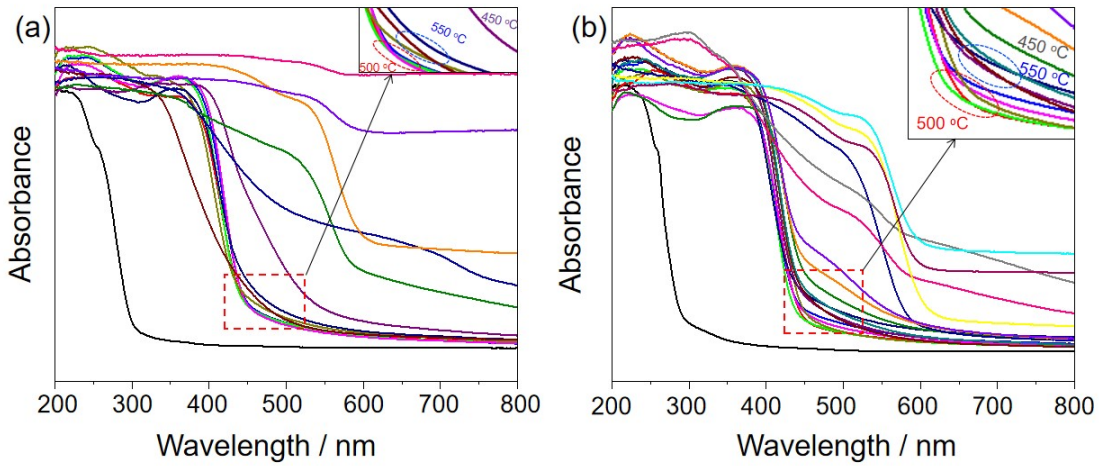

Figure S5. UV-vis DRS of (a) $KLaTa_2O_7$ and (b) $KCa_2Ta_3O_{10}$ and various nitrided samples. The small box shows a partial enlargement.

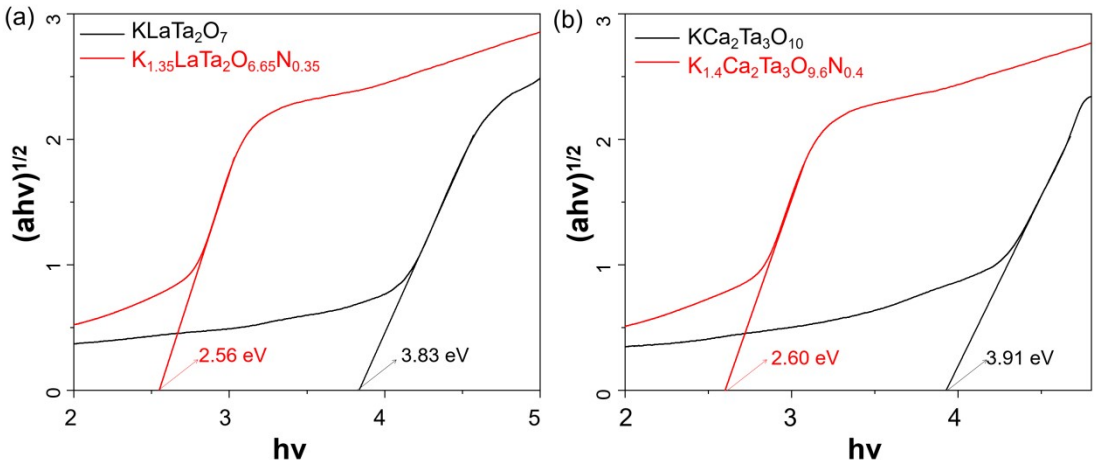

Figure S6. Tauc plots for the calculation of band gaps.

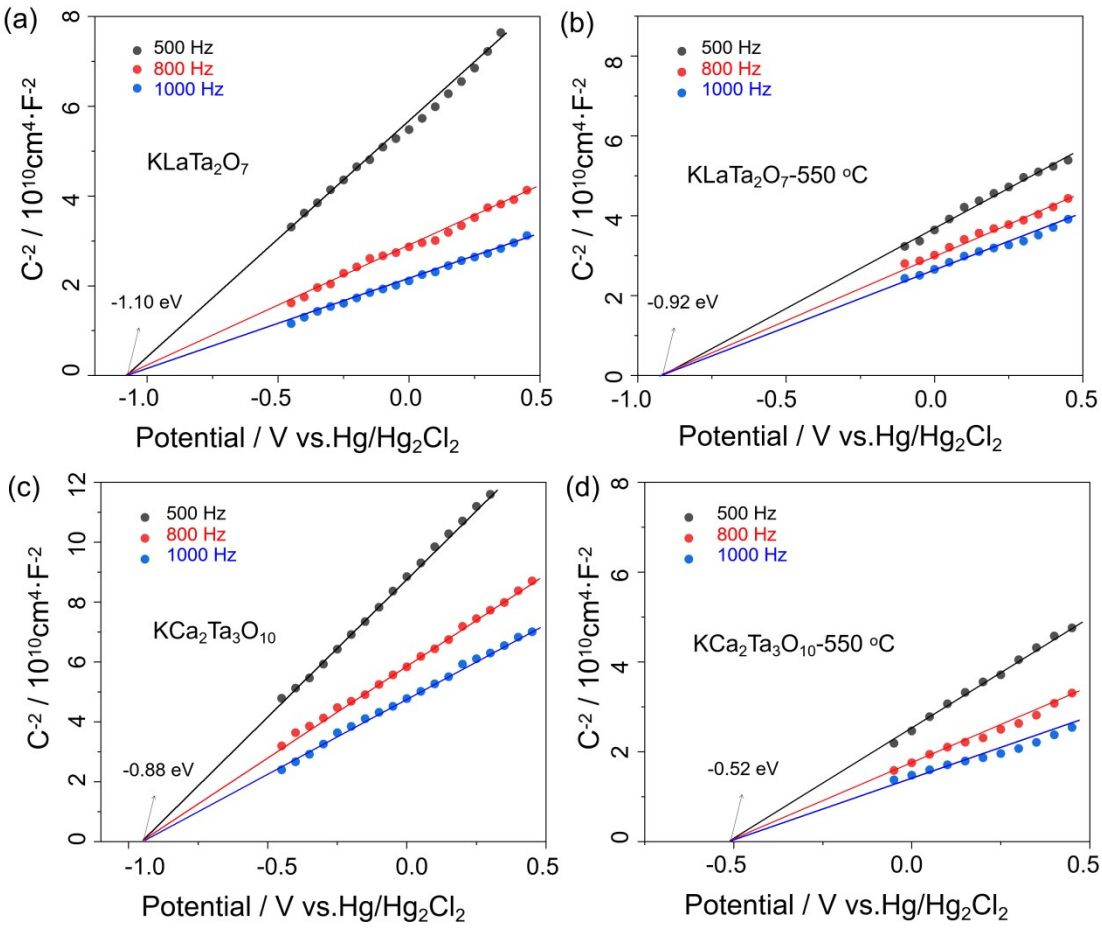

Figure S7. Mott-Schottky plots of $KLaTa_2O_7$, $KCa_2Ta_3O_{10}$, and their nitridated samples at the frequency of 500, 800, and 1000 Hz.

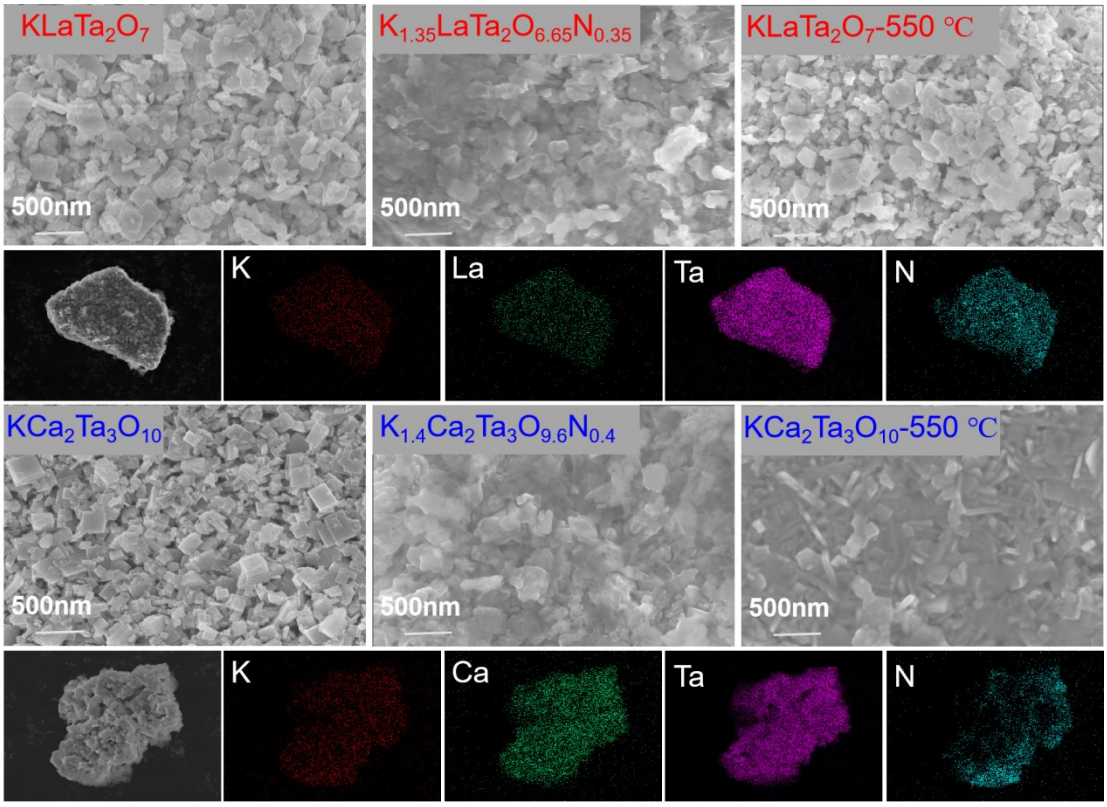

Figure S8. SEM images of $KLaTa_2O_7$, $KCa_2Ta_3O_{10}$, and their nitrided products obtained at 500 ℃ and 550 ℃. EDS elemental mapping images of the samples obtained at 500 ℃.

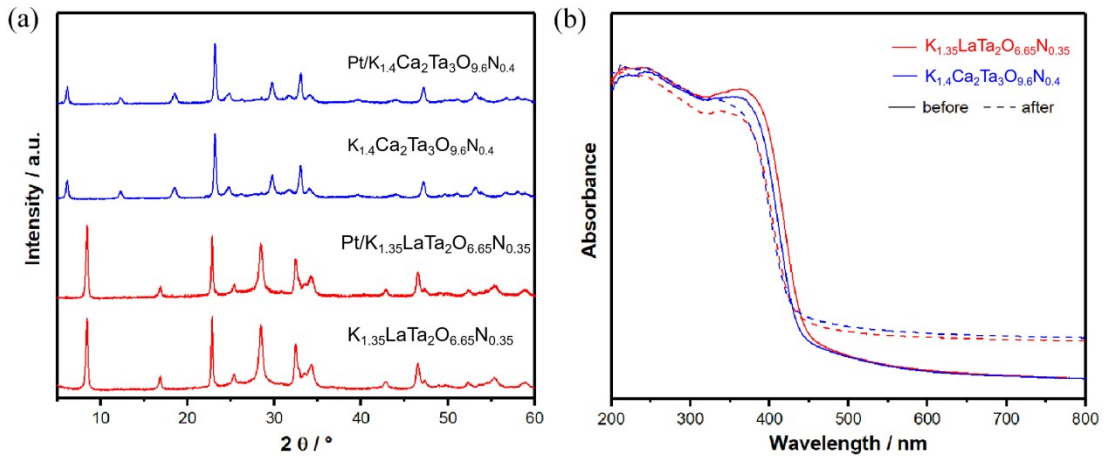

Figure S9. (a) XRD patterns and (b) DRS of $K_{1.35}LaTa_2O_{6.65}N_{0.35}$ and $K_{1.4}Ca_2Ta_3O_{9.6}N_{0.4}$ before and after Pt loading.

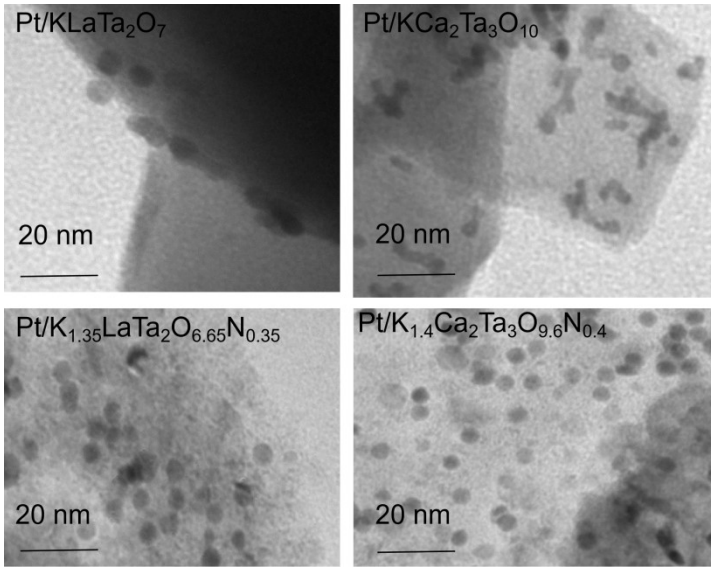

Figure S10. TEM images of $Pt/KLaTa_2O_7$, $Pt/KCa_2Ta_3O_{10}$, $Pt/K_{1.35}LaTa_2O_{6.65}N_{0.35}$, and $Pt/K_{1.4}Ca_2Ta_3O_{9.6}N_{0.4}$ photocatalysts.

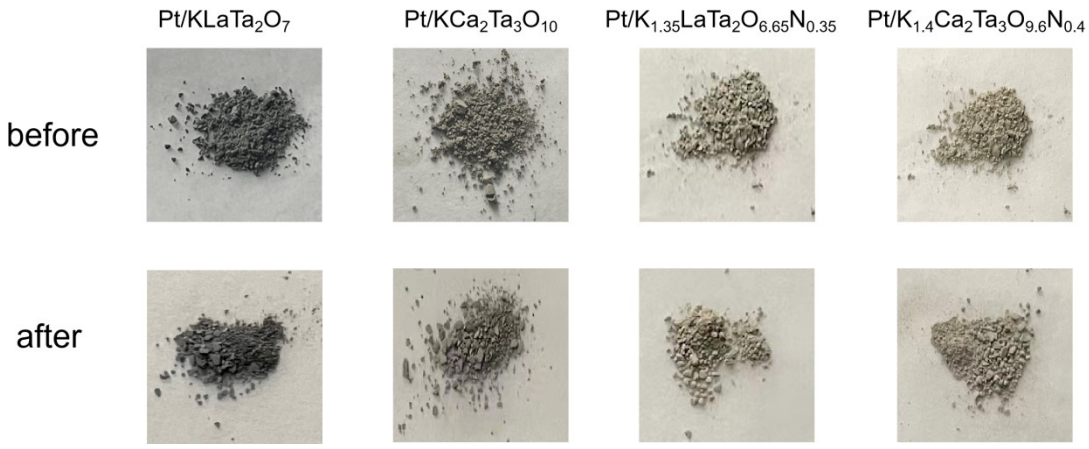

Figure 11. Sample colors before and after photocatalysis reactions.

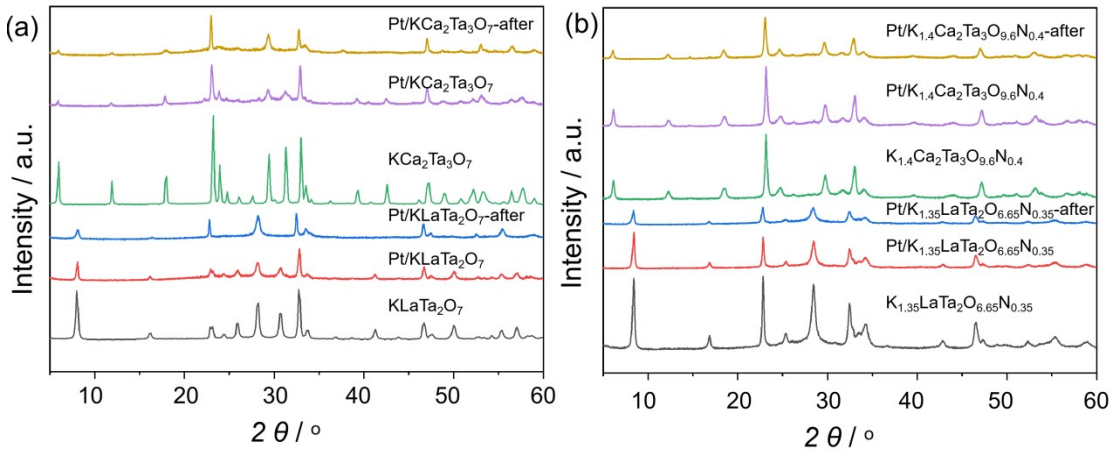

Figure 12. XRD patterns of the photocatalysts that before and after the photocatalysis reaction.

Table S1. Atomic composition of samples was determined by SEM-EDS. The molar ratio of oxide/K_2CO_3 is 1:1.

Samples	**Atomic ratio**		
	K/Ta	**La/Ta**	**Ca/Ta**
KLaTaO	0.43(3)	0.59(1)	-
KLaTaON-500	0.34(2)	0.54(3)	-
KLaTaON-550	0.30 (3)	0.63 (2)	-
KCaTaO	0.34(2)	-	0.67(1)
KCaTaON-500	0.25(3)	-	0.61(2)
KCaTaON-550	0.19 (5)	-	0.58 (4)

Table S2. Atomic composition of samples was determined by SEM-EDS. The molar ratio of oxide/K_2CO_3 is 1:0.

Samples	**Atomic ratio**
	K/Ta
KLaTaON-500	0.24(4)
KLaTaON-550	0.20 (2)
KCaTaON-500	0.29(2)
KCaTaON-550	0.12 (3)

Table S3. The size of Pt nanoparticles on the sample surface, results were calculated from TEM images.

Samples	Size
$Pt/KLaTa_2O_7$	4.4±0.87nm
$Pt/K_{1.35}LaTa_2O_{6.65}N_{0.35}$	4.45±0.075nm
$Pt/KCa_2Ta_3O_{10}$	4.34±0.44nm
$Pt/K_{1.4}Ca_2Ta_3O_{9.6}N_{0.4}$	4.38±0.63nm